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There are two questions I want to address in this paper.

1) What is the evidential status of hypothetical entities such as quarks and theories such as QCD? In particular is there a special status there and special problematic associated with just these entities and this theory?

But that leads to the second question of a more general nature

2) What is the evidential status of any theoretical entities and their properties and relations as encoded in some area of theoretical discourse, in theoretical physics?

The second question touches on a central concern of general philosophy of science.

But let me start with the first question.

For Lévy quarks just came into the physics vocabulary via as the fundamental representation of the SU(3) symmetry introduced into hadronic particle physics in the early 1960s by Murray Gell-Mann and Yuval Neeman.

The actual particles were represented with terms of higher-dimensional representations of the SU(3) symmetry such as the octet etc original eight-fold way. The quarks were at first a somewhat shadowy substance in fitting up the particles actually observed in

some, though, has 6 *

One could reason from ~~concepts~~ from
an algebra of currents, and take
the seriously and discard the
quarks - throwing away the ladder
after making the arrest so to speak.

But then, in the late 1960s came
the deep inelastic electron scattering
experiments at SLAC, the verification
of Bjorken scaling, and the immediate
interpretation in terms of parton-like
constituents, the parton model of
the nucleon. It was also a

small step to identify the partons,
what in a sense are called directly
'seen' with the highly conjectured quarks.

But with the goods came the
theory of weak interactions, the
colour degrees of freedom, the 'gluon'
fields and the whole 'apparatus'
of non-Abelian gauge theory in the
now familiar Standard Model, augmenting
the electro-weak theory of Weinberg
and Salam with the quantum chromodynamics
of strong interactions.

[
newer And there were immediate successes
in terms of enforced predictions
of quantitatively verified departures
from crude Bjorken scaling, the
production of jets and so on.

So did physicists believe in the
theory? (I will come to philosophers
later). Well not exactly, it was not
that the theory was enforced, refuted
far from it, but that there were predicted

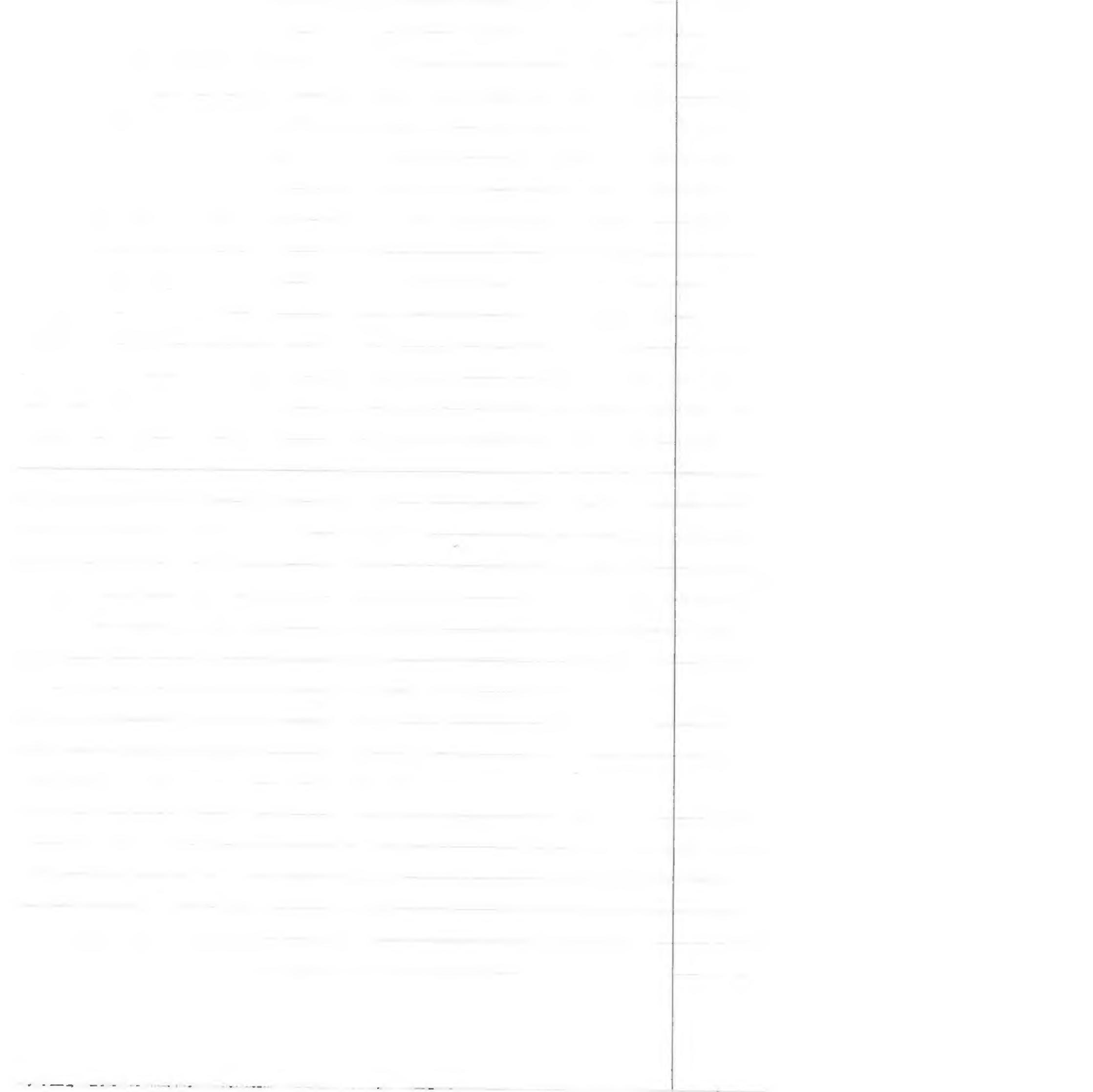
— which also do the same thing
and which is introduced into the body.
— so that it can be absorbed
and used by the body.
— so that it can be absorbed
and used by the body.
— so that it can be absorbed
and used by the body.
— so that it can be absorbed
and used by the body.

Most theories have some words in
the theory of strong interactions.
Firstly there was the general unsatisfactory
business of infinite renormalization, ~~regard of course~~
~~in so-called renormalizable theories.~~

Most physicists regarded renormalized
theories as "the sort of 'effective
theory'" hiding the detail of the 'true'
theory behind renormalized parameters,
whose values were to be taken from
experiment.

Next there was a sense of
ad hocery in the number of adjustable
parameters in the Standard Model,
and the curious role of the Higgs
particle in the electroweak sector.
In fact most physicists were drawn by
the holy Grail of grand unification,
trying to couple all quarks and
leptons in a single scheme. Grand unified
theories generally predicted the
~~instability~~ of the proton via the
~~conversion~~ of quarks into leptons.
This has not so far been observed,
but most physicists except that it is
an allowed process although on a
very long time scale. To this extent
they do not believe much of it as
the final theory.

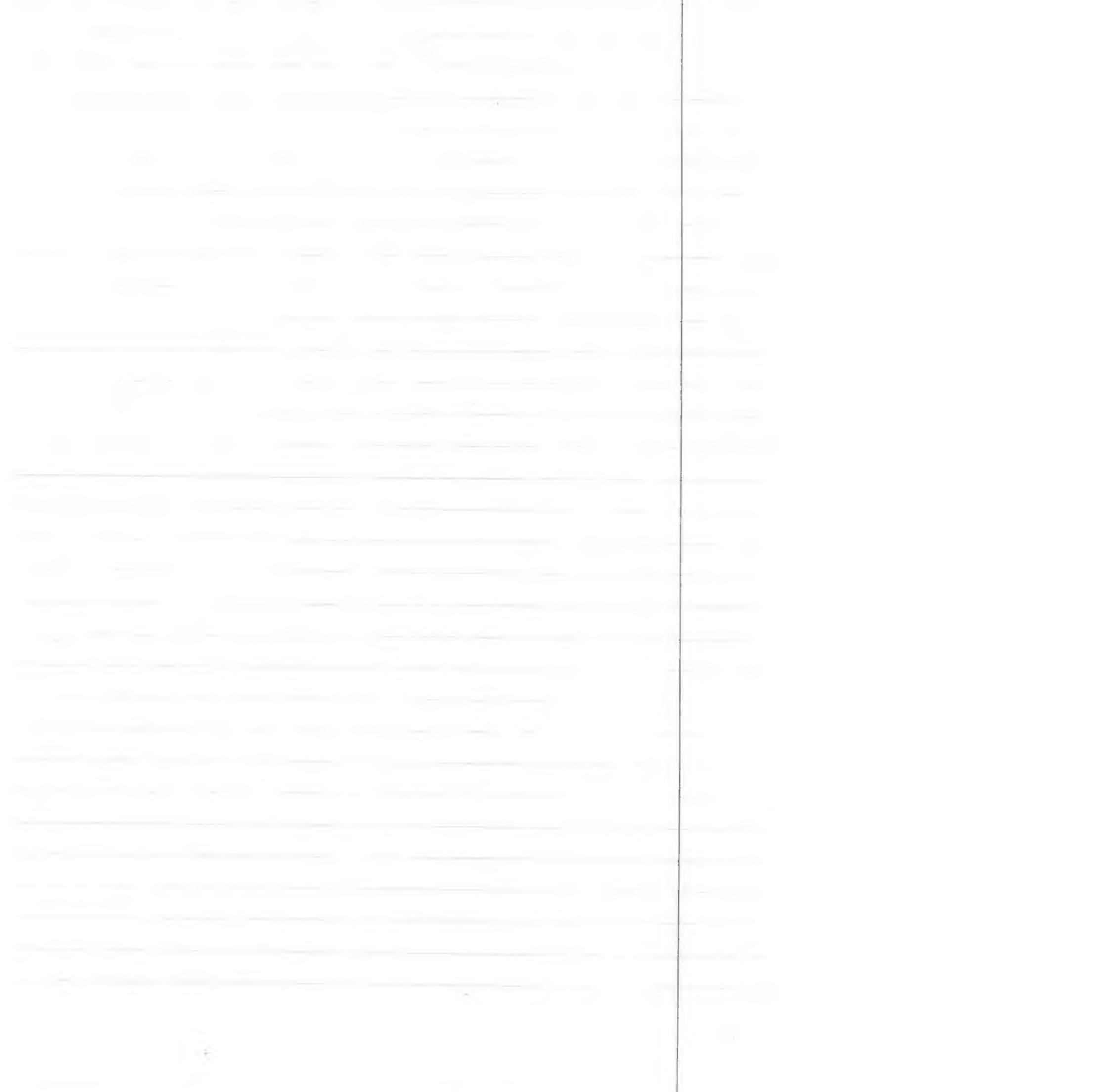
Finally there is of course the whole
question of incorporating gravitation
in a theory of everything and the
recent surge of enthusiasm for
superstring theories.



"Do physicists believe in classical mechanics?". The answer is yes for certain limited purposes of statistical modelling of phenomena but not in the sense that it is a serious candidate for being the ~~best~~ ^{best} right - the final answer is strong interaction physics.

[But what about the quarks themselves? This is often thought to be a special problem for associated with the phenomenon of quark confinement. In the past the real has been probed and the manifest destroys atoms, nucleus and so on could be dealt with singly in their free state and then everything explained by an elaborate aufbau principle passing the sing. charge testes. This is the standard picture of understanding complex nuclei in terms of their simple constituents. But in a sense the quarks are a sort of counterexample, since they cannot be separated from their partners.

[But the other in many real cases manifest is a somewhat ~~strange~~ ^{strange} reading of what we mean by manifest. The deep inelastic scattering experiments manifest the quarks just as surely as holding them, 'in at a time';



to speak. Good answer
actually pretty 'radical', so far
as particle physics is concerned.
We see particle by actuals seeing
what they can do. Not very good
less focus in bubble chambers, fire
off Hartshorners and so on.

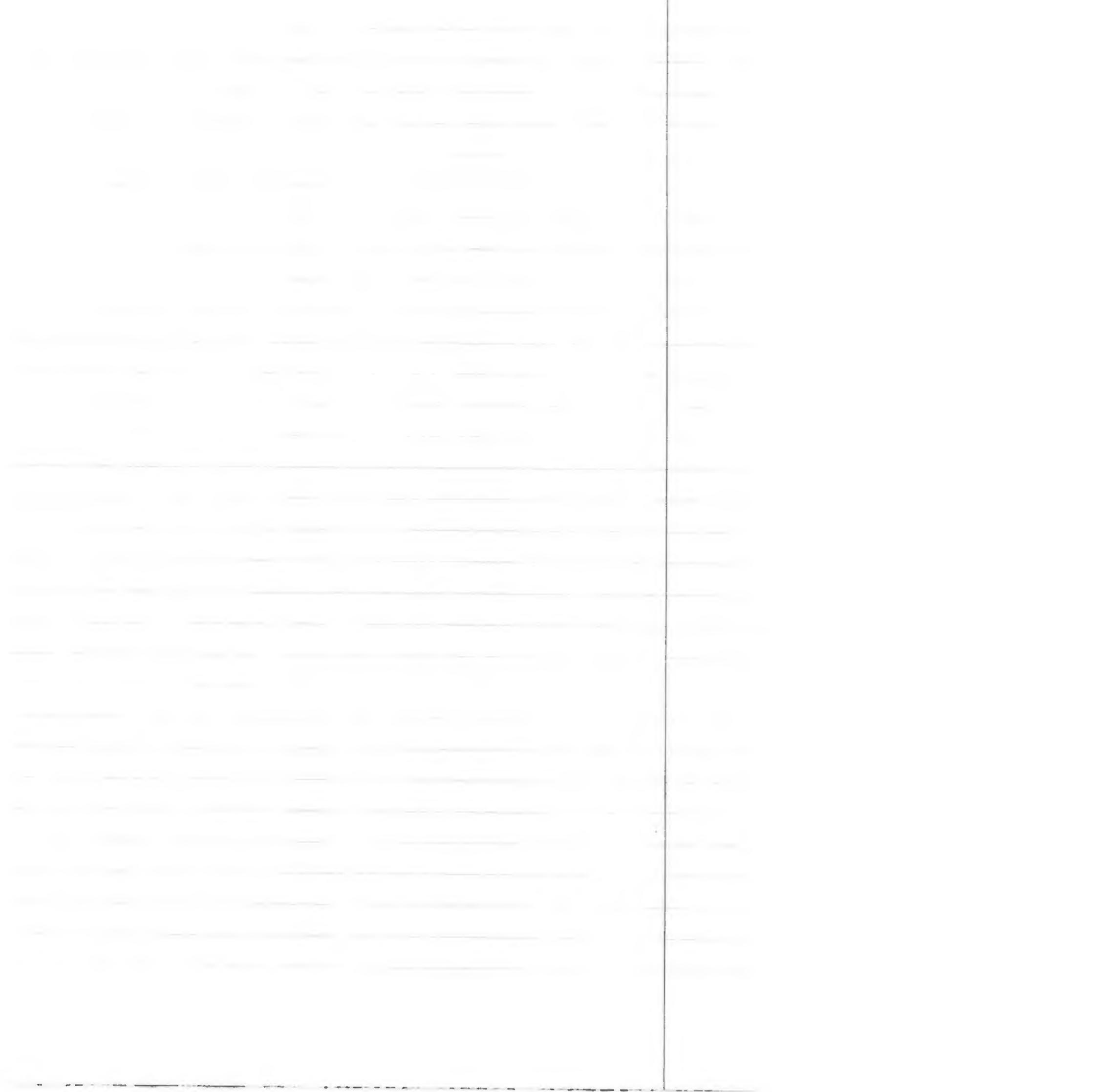
Let me now turn to what I
philosophers might say on reading
the preceding paragraphs, what are
supposed to represent the 'views'
of physicists. I will therefore turn
to my second paper which has
a much broader focus than just
particle and field.

In what sense should one believe
in science at all?

(Here goes a broad spectrum to
what I think is an extension
in some way and a question which
fill the pages of Philosophical Propriety
and Journalism.

At one end of the spectrum there are
the relativists, the anti-realists, the
materialists. At the other end are
the realists, the objectivists,
the theory of 'scrubbed materialism'
and this is pretty well every body
in between.

(Let me first sketch the extremes and
then look at the compromise.
But as we shall see ^{and to the} compromise
positions are usually unstable, and



way to truth independently.
It is the result of the
realist's own effort.

First the realist denies that there
is an objective fact of the matter about
any area of discourse whether it be
natural science, ethical questions, or
even logic and mathematics. There
is no ~~as~~ Archimedean Point, no
God's-eye perspective, from which
truth is in some sense of
independence with what is actually
the case, makes any sense of any
claim to 'justifiability' as it is
in itself. The Kantian being-as-it-is,
is just 'a metaphysical concept.'

How, say the realists, could
we obtain knowledge of other
things unless by observing what they
are in 'reality' or in the
basis of scientific induction, which,
they say is it conditioned by, idealist
postulates that it can provide no
true conditions for reality; so
it is falsehood and misery to
assert truths about reality without
the ... say, science and ...

Nothing is 'existing' to us
in the world. Let us, however, let
us not belittle God. He is not
only in the sun, stars, and
universe, but also in the world, in



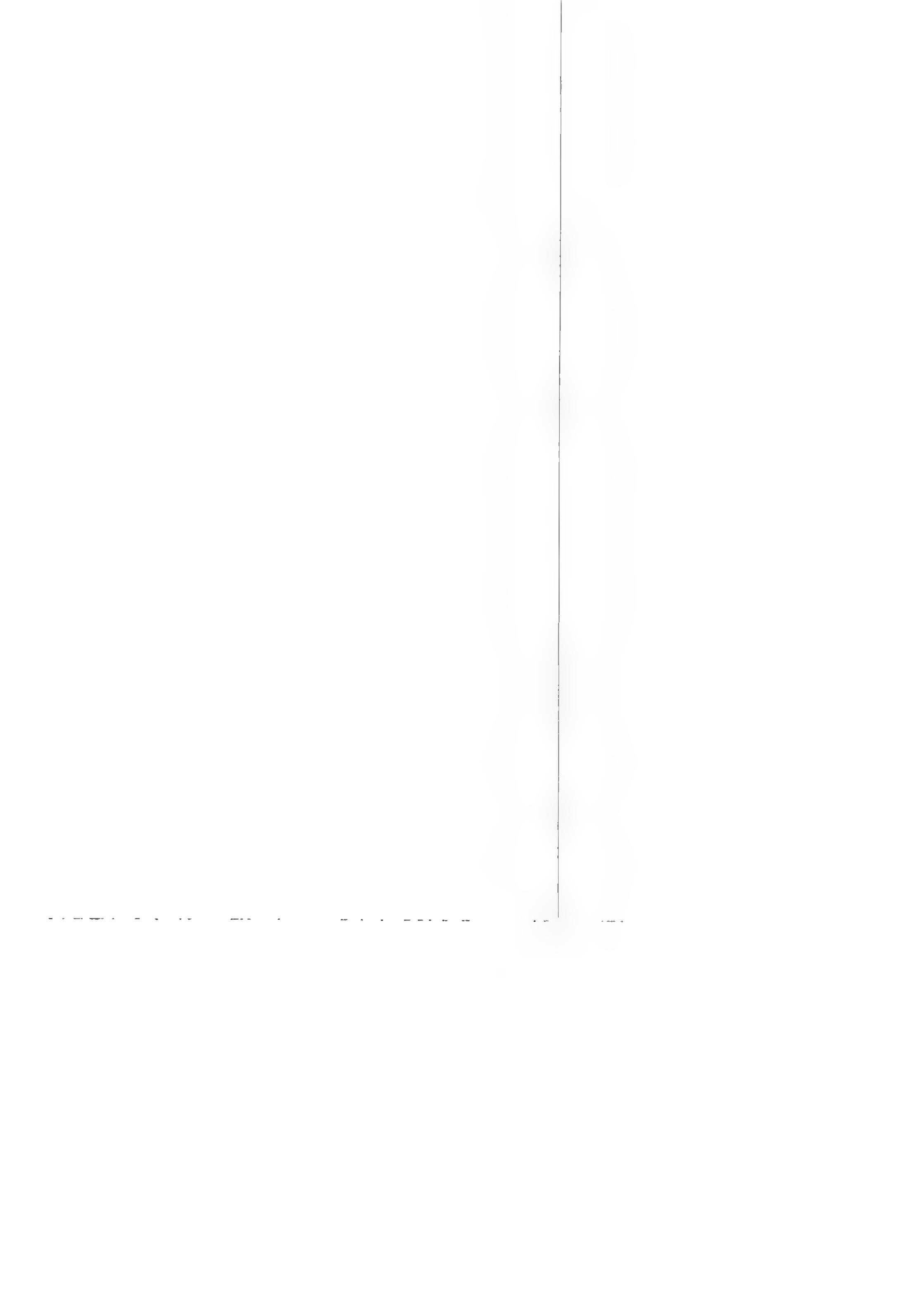
but I think you are right
in this as that you don't rot
them this exactly if a lot, or
a few, and it will again have
the "soak out" effect
and make them "soak flat"
and taste like people know
it and go back to highway
pines and let them out, the
most common being which
is the last listed. This has been
shown not to be well liked with
this kind of people. Information of
pines other than this is first of
all, as far as I know, from us.
What I gathered is, that we
have a few, perhaps even
with the last one, an almost all
red slate, and that is
a whitish grey
or yellowish grey.

Curious
mineralization of the slate
minerals, I think, is the
one this is from, of course,
but it is slate, of course,
and there is no slate
in the world, this is not
the same as the slate.

The only mineral
that I can see much
of is slate, but

200-1
200-2

... so what's left over
is just the movement,
nothing else, and I sit
there and think, "What good is it
that I'm not moving?"
and it's just one of those feelings
that you have when you're
surviving, like they're just
going to go on the bush and
you're trying to just sit there
and pretend that, like the last
introduction, you're going to
have to deal with it.
They talk until you know,
they argue, and then you
think, "What's the point of all this?
What's the point of all this
man?" You look around and
you don't feel anything.
You sit there and it's like
you're waiting for something, knowing
that the world outside exists.
It's an empty void, and
you're waiting for something, and
it's like you want to be
able to feel something when it's
like it's not there, it's not there
but you want to feel it
so that you can feel it
exist. It's like you don't
feel like this isn't real; it's not real



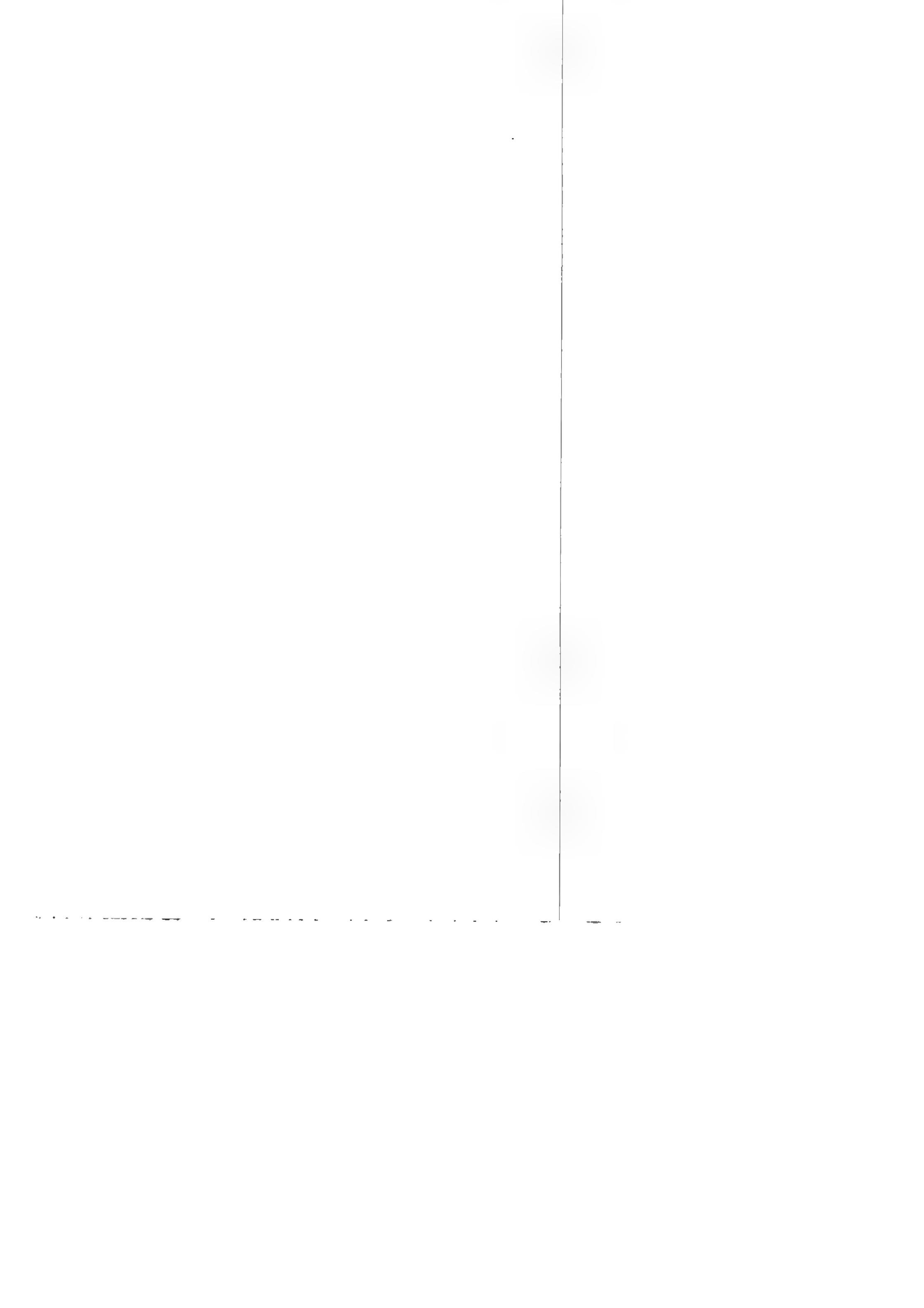
and I am awaiting your
word and its exact formula
for lifting and suspension.

It will not much do it will
be limited and, at the same time,
it will not be little. The
size of such a beam has been
considered? There is a lot of other
material and there is each
moment of a lot of steel which
will not be used for the project.

The problem is this, we
have to make the beam
as light as possible, but it
is not possible to do so
by using a lot of steel
and it is also very difficult
to make a concrete which
is not too heavy, but which
is not too light, because
the beam will be suspended
in the wind of 100 km/h
and it must not fall down
and it must not be too light
because it will fall down
and it must not be too heavy
because it will not fly up
and it must not be too heavy
because it will not fly up
and it must not be too heavy
because it will not fly up

Is not steel a good choice?

and we can't do without
steel, we need a lot of
steel, we can't do without



much as one of truth as ~~an~~
material concern of some idealist enquiry
~~idealists~~ enquires, but how can we
tell what makes an ~~idealists~~ enquirer?
I could it be, critically, just because
one ultimately comes 'to agree with
you yourself'. But the pull to
extreme relativism is really impossible
to resist. So the task of returning
into a relativist, is not to allow
the first, subtle, allowing more, of
your soft on truth. For years, it may
not matter so much, but in everyday
life I believe it really does make
a difference ^{whether} we believe in natural
laws ^{or against} or not. And I know
and I know for sure what 'jelly' I
want to travel in, the realists or
the relativists.

[So let us start again at the
other end, and ask: does the
realists start ^{relating to do macroscopic world} matter in
everyday life? And if the answer
seems to be 'yes' let us
make the reverse slide if I
can put it like that from a
robust realism about tables
and chairs, to a definitely more
existant realism, but realism all
at same, about quarks and Q.D.
I believe the physics just feels
for this this is probably right (but
is another costume for you) and I
will say that the right-wasy but ultimate

are as common as ~~green~~ ^{yellow}, orange
~~orange~~

~~I am~~ I am invited to my socio-economic experiment,
I will simply respond: "Poppycock".

